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JAPAN'S ENERGY POLICY: 1987 UPDATE

Summary

Once again, changes in the price of oil and the yen-dollar exchange rate wreaked havoc with Tokyo's energy policies last year. Unlike 1986, though, the two factors worked against each other rather than in concert with one another. While industrial and residential users continued to benefit from falling energy prices, government policymakers wrestled with lower oil tax revenues and shifting energy program priorities. An unexpected obstacle disrupted one area of international cooperation when congressional unease derailed quick ratification of a new bilateral nuclear fuel treaty. Despite these setbacks, Japan's energy policy remains firmly on the road to greater efficiency and less dependence on fossil fuels.

The Big Picture

According to the Ministry of International Trade and Industry, Japan consumed less energy of all types between April 1986 and March 1987 while overall supplies fell 1.1 percent (Table 1). The decline in consumption was primarily attributable to an economic slowdown as the country adjusted to the stronger yen; real gross national product growth dropped to 2.6 percent, down from 4.4 percent in FY 1985. Crude oil purchases continued to decline (see Table 2), thanks partly to rising imports of gasoline and kerosene made possible by a more liberal government policy (Table 3).

Table 4 shows the conflicting trends in world crude oil prices and in the yen-dollar exchange rate. Rising global consumption and a restoration of

some semblance of production discipline by the Organization of Petroleum Exporting Countries pushed the dollar price of oil from just under $15 a barrel in January 1987 to almost $18.50 in November, a 23 percent increase. On the other hand, the yen's appreciation against the dollar helped to cushion the impact: prices in yen terms rose just 6.9 percent. The upturn quickly worked its way through to the wholesale and retail levels, but prices near the end of 1987 remained below the 1986 averages in nearly all cases (see Tables 5 and 6).

The prices of other energy imports were mixed, revealing the impact of oil's changing price competitiveness and long-term programs to promote alternative sources. On the import side (Table 7), coal fell back in 1986 from 1985's record volume and then leveled off last year, primarily due to flat demand from steel producers. The trend in heavy fuel oil imports can be laid to efforts to convert to other energy sources. Naphtha purchases, which jumped strongly in 1986, rose again in 1987, in part because the decline in world oil prices improved the competitiveness of Japan's petrochemical industry, which uses naphtha as both a feedstock and a fuel. As for consumption (Table 8), it seems that industrial and residential users increasingly favor the liquid alternative: imports and usage of both liquefied natural and petroleum gases have continued to grow.

Electricity output figures (Table 9) reveal that both hydroelectric and thermal energy supplies shrank in 1986 and again last year. Although the decline in hydroelectric power was less severe than the drop in 1984 caused by drought, it highlighted the inherent instability of this source. The reduced contribution from thermal sources reflected the slow but steady shift toward nuclear power. The gain in nuclear power generation, however, appears to be the result of an increase in operating rate (from an average of 74.2 percent in 1986 to 76.2 percent in 1987) rather than capacity, since no new plants came on line.

Total electricity consumption fell in 1986 from 1985's record level, mainly due to a sharp drop in manufacturing demand (Table 10). The steel and chemical industries together accounted for 8.42 billion kilowatt-hours of the 11.7 billion kilowatt-hour decline in industrial demand. While these two industries appear to have recovered somewhat in the first nine months of 1987 (the latest period for which data are available), they still lag behind the growth of overall manufacturing consumption. Demand for lighting, however, showed a solid gain in 1986 and an even sharper upturn at the end of 1987, thanks to a jump in residential demand.

In fact, households were clearly unaffected by the yen's rise in terms of energy consumption in 1986, while the opposite was true of industry (see Tables 11 and 12). Residential use of all modern fuels has risen steadily, while demand for coal and other solids (charcoal and briquettes) continues to dwindle. On the industrial side, demand bounced back from 1986's lows to set a new record in 1987 even though the conservation drive remained in high gear and several major energy-using industries continued to be phased back, particularly mining and nonferrous metals.

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Policy Problems

While cheaper energy has been a boon to industry it is a problem for government planners, since lower prices mean lower tax revenues. Revised estimates of fiscal 1987 revenues from taxes on gasoline, liquefied petroleum gas, aviation fuel and petroleum are unchanged from initial estimates; however, officials expect a revenue shortfall, particularly with regard to gasoline tax receipts. This is tacitly acknowledged in the 17.7 percent drop in FY 1988 estimates of gasoline tax revenues, continuing a slide that began in fiscal 1985. Petroleum tax revenues show a similar though sharper fall. Tax receipts from crude oil imports plunged from Y400 billion ($3.2 billion at Y125=$1.00) in fiscal 1985 to Y190 billion ($1.5 billion) two years later. Tax planners have opted to raise the tax rate in an effort to stem the decline, and FY 1988 receipts are projected to rise 52.6 percent to Y290 billion ($2.3 billion). Oil companies have lobbied against the tax increase but it appears that their efforts will not be successful.

While the reduced receipts are balanced in some cases by lower outlays, particularly for building strategic reserves and price control programs, Tokyo remains committed to certain energy programs. Although the overall general account budget for fiscal 1988 calls for a 6.8 percent decline in energy programs, a detailed inspection of the energy budget is revealing. Funds for the following programs will be cut: developing new sources of crude oil (5.1 percent); restructuring the domestic oil industry by encouraging mergers and plant closings to reduce capacity (5.5 percent); restructuring the domestic coal industry by similar means (17.9 percent); and developing coal-related technologies (26.6 percent). On the other hand, allocations for more energy-efficient equipment will rise 36.8 percent, funds for adding electric generating capacity will jump 13.8 percent, and outlays for alternative energy development will increase 5.3 percent.

Tokyo should be able to employ an energy budget strategy of "taking from Peter to pay Paul" for at least the next few years thanks to two previous decisions. Funds now spent to support the ailing coal industry will be freed by FY 1991, by which time a 47.5 percent reduction in domestic output is planned. Coal industry programs account for about 15.5 percent of energy program outlays. Another block of funds will be available as Tokyo loosens controls on imports of refined petroleum products. After great controversy, imports of gasoline and kerosene (which is still used in many homes for heat and light) were permitted beginning in 1986. The program has been popular, particularly after the yen's appreciation sharply increased the price competitiveness of foreign refined products. If the liberalization program is expanded, a significant share of the funds related to crude oil imports (which now account for 46.1 percent of the total energy budget) could be redirected.

New Long-Term Energy Outlook

The strong yen has an even broader impact on energy policy than prices and tax revenues, however. The currency realignment has spurred the restructuring of Japan's economy from export-dependent to domestic demand-driven, and accelerated the transition to the post-industrial stage of economic growth. The shift away from exports will rearrange Japan's industrial structure and the composition of energy demand and consumption. Economic maturity promises to

reduce total energy demand, since a greater proportion of growth will come from services and high technology, both less energy-intensive than traditional manufacturing.

Responding to these shifts, the Ministry of International Trade and Industry has drawn up a new long-term outlook for energy demand and supply (see Tables 13 and 14). When compared with the 1983 outlook, several aspects of the new forecast stand out. First, overall energy demand is expected to grow at a much slower rate. Similarly, the role of fossil fuels is expected to shrink more slowly, indicating that planners think supplies will remain abundant. Coal will play the same role on a percentage basis, but the absolute amount consumed is expected to drop significantly. Finally, the outlook for nuclear power is slightly less rosy than before. This may be due to the impact of the Chernobyl disaster, but it could also be an admission that the major issue of fuel reprocessing will remain unresolved.

Nuclear Power: Keystone or Achilles Heel?

The one budget spending category that is likely to be reduction-proof is nuclear power, and in particular nuclear safety. The reactor meltdown at the Soviet Union's Chernobyl plant prompted a wave of anxiety in Japan. The government tried to calm public fears by pointing out that Japan did not have any plants that were similar to Chernobyl's, and that Japan's safety record was one of the best in the world. Nevertheless, expenditures for safety programs will rise 11.5 percent in the coming fiscal year, far more than the 6.3 percent increase in the overall budget for nuclear power. The only other area to receive more funding in fiscal 1988 is nuclear fuel cycle research; outlays for development and construction of experimental reactors will remain unchanged.

The overall health of the nuclear power industry is unquestionable. While no new reactors are planned in the United States, 18 are on the drawing board in Japan. The total amount of power generated by nuclear plants is expected to jump 53.7 percent in Japan by the year 2000, compared with an 8.6 percent increase in the United States. To be sure, Japan's nuclear industry will remain small in absolute terms in comparison to this country's (total U.S. generating capacity is presently four times greater and will still be twice as large in 2000), but it is much more active. Development of breeder reactors, advanced thermal reactors and improved fuel enrichment and recovery technologies are proceeding apace in Japan, while U.S. programs languish. On a more down-to-earth level, Japanese experience at building and designing nuclear plants and equipment will continue to advance, thanks to the numerous plants planned at home and abroad. U.S. companies, facing a dearth of domestic orders, will have fewer opportunities to improve their skills.

In the face of this growing competence, many analysts fear that Japan will emerge as the world leader in nuclear technology in the near future. Just as Washington has been able to influence the nuclear industries of other countries by regulating how, when and where U.S. nuclear equipment and fuel is used, so Tokyo may have such power in the future. This appears ominous to some Americans, particularly against the background of the Toshiba Machine Co., Ltd. affair. To others, the possibility that Tokyo will be able to control components in the next generation of U.S. reactors that are built is of equal concern.

U.S.-Japan Nuclear Cooperation Agreement

All these pressures are evident in the debate over whether Congress should ratify a new bilateral nuclear cooperation agreement submitted by the administration. The main points of the new pact include: blanket approval of Japanese reprocessing of nuclear fuel obtained from the United States; adequate precautions against terrorist and other threats in transporting the fuel; stronger Japanese controls on the use of plutonium; and reciprocal rights over nuclear fuel and technology. From the White House's point of view, the treaty is technically sound and satifies the demands of security. As far as Tokyo is concerned, the agreement insulates the recycling process from the vagaries of American politics. At present, the Department of Energy must approve reprocessing requests on a case-by-case basis. Approval times are currently well under a year, but have been substantially longer under previous administrations. The new accord also offers some defense against arbitrary control of U.S. technology by providing Tokyo similar rights over Japanese know-how.

Congress, however, is unimpressed with the pact. To prevent the treaty from coming into force in mid-April, both houses must reject it. The issue of physical safety during transport (insuring that the nuclear fuel containment vessel does not break in the event of an airplane crash) and transport routes (Alaskan airspace would be traversed during flights from Japan to European reprocessing centers) has gained wide attention. While these concerns are valid, they mask the real issue: U.S. reluctance to give up control over nuclear fuel and all it represents. The distrust of Tokyo when it comes to matters that influence American security or relate to leading-edge technologies is almost palpable on the Hill. The first evidence of congressional reticence was the approval of an amendment to a vital budget bill prohibiting overflights of plutonium unless a panel of experts deems the transport vessel crash-proof (see JEI Report No. 1B, January 8, 1988). The pact really encountered difficulties in the Senate Foreign Relations Committee, which voted to report the treaty to the full Senate with an unfavorable recommendation (see JEI Report No. 4A, January 29, 1988).

The Senate is now trying to decide what to do with the bill. An outright rejection would worsen already poor relations with the White House, yet several influential senators feel the bill in its current form is unacceptable. Neither can the Senate simply ask the administration to renegotiate the pact unless it has a clear idea of what needs to be changed. The view from the other end of Pennsylvania Avenue is equally muddy. It is unlikely that the lame-duck administration can force the Senate to adopt the treaty, so it is trying to reassure senators that their concerns can be met within its framework. On March 10 the administration proposed a polar route that avoids all inhabited territory and is within the range of Boeing Co.'s latest aircraft. It is not at all certain that such a soft-sell will work; Senate opponents have dismissed the new route and will call for debate on rejecting the treaty.

Tokyo could become frustrated with the entire process, although it has no alternative but to persist. If the treaty is not ratified, the existing treaty will remain in force. While it is not ideal, it does allow Tokyo to continue its nuclear development program. The nuclear pact, which could contribute to bilateral harmony, has instead become a victim of bilateral discord.

Conclusion

Tokyo has moved aggressively to deal with some of the forces upsetting its energy policies: the strong yen, industrial restructuring and unstable global energy markets. Other problems have proved more resistant to quick solutions, particularly budget priorities and the bilateral nuclear agreement. Tokyo remains confident, however, that its emphasis on conservation, diversification and development of alternatives remains the right course.

For further information, contact Jon Choy

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The views expressed in this report are those of the author and do not necessarily represent those of the Japan Economic Institute.

Table 1: Japan's Energy Supply by Source

(in millions of units)

	FY 1985			FY 1986			
	Actual	Crude Oil Equivalent	Share	Actual	Crude Oil Equivalent	Share	Percent Change
Oil (kl)	248.7	248.7	56.7%	246.0	246.0	56.8%	-1.1%
Coal (mt)	110.9	83.6	19.1	103.9	79.2	18.3	-6.3
Nuclear (kw)	24.7	41.7	9.5	25.8	41.1	9.5	4.5
Natural Gas (kl)	41.3	41.3	9.4	42.8	42.8	9.9	3.6
Hydroelectric (kw)	34.5	21.7	4.9	35.8	18.2	4.2	3.8
Alternatives (kl)	1.7	1.8	0.4	5.9	6.1	1.4	247.1
Total		438.8	100.0		433.9	100.0	-1.1

Source: Ministry of International Trade and Industry

Table 2: Japan's Crude Oil Imports, Production and Inventories

(in thousands of barrels)

	Production	Imports	Throughput	Rate of Operation	Inventories
1980	3,177	1,615,480	1,462,123	67.3%	238,020
1981	2,868	1,448,203	1,321,353	60.9	226,302
1982	2,937	1,350,369	1,225,566	56.5	205,916
1983	3,095	1,307,024	1,181,136	56.9	185,870
1984	2,994	1,349,847	1,220,958	67.1	163,905
1985	3,931	1,247,496	1,130,973	62.3	160,288
1986	4,629	1,223,499	1,082,326	60.6	175,415
1987	4,076*	1,166,079	1,053,169	371.8	1,011,402

*Through November only.

Source: Petroleum Association of Japan

Table 3: Japan's Imports of Gasoline and Kerosene

(in 1,000 kiloliters)

	Gasoline		Kerosene	
	Amount	Percent Change	Amount	Percent Change
1985	0	--	0	--
1986	3,293	--	2,648	--
1987	4,190	27.2%	6,012	127.0%
January	259	5.7	694	631.1
February	211	164.3	536	-10.8
March	434	112.1	373	19.3
April	254	117.4	230	*
May	458	216.4	255	*
June	426	79.3	305	1,123.9
July	331	-14.3	299	155.9
August	394	5.8	608	867.3
September	200	-34.3	611	727.8
October	492	55.0	619	240.6
November	388	11.4	599	52.3
December	341	-35.2	882	12.7

*1986 imports were zero.

Source: Petroleum Association of Japan

Table 4: Price (c.i.f.) of Imported Crude Oil

	Volume (1,000 bbl)	Value ($ millions)	Dollars per bbl	Yen per kiloliter	Exchange Rate*
1980	1,600,352	$52,749	$32.97	Y47,197	Y236.14
1981	1,430,623	53,343	37.29	51,387	219.10
1982	1,334,958	46,266	34.66	53,906	247.28
1983	1,302,055	40,063	30.77	45,923	237.28
1984	1,314,034	39,379	29.36	43,713	236.66
1985	1,232,494	34,600	28.07	42,374	239.97
1986	1,187,791	19,502	16.42	18,189	176.12
1987	1,162,018	20,657	17.84	16,355	146.01
January	117,239	1,757	14.99	14,994	159.01
February	104,773	1,789	17.07	16,399	152.70
March	100,942	1,791	17.75	17,131	153.47
April	102,238	1,840	18.00	16,636	146.97
May	78,474	1,423	18.13	15,957	139.91
June	80,179	1,456	18.16	16,285	142.58
July	86,720	1,580	18.22	16,940	147.81
August	87,431	1,591	18.20	17,265	150.83
September	90,475	1,664	18.39	16,543	143.02
October	94,992	1,747	18.39	16,722	144.59
November	109,641	2,017	18.40	16,029	138.52
December	108,914	2,002	18.41	15,361	132.65

*Yen per dollar

Source: Ministry of Finance

Table 5: Wholesale Petroleum Product Price Indices

(1980=100)

	Gasoline	Naphtha	Jet Fuel	Kerosene	LPG	Fuel Oil
1981	106.2	99.7	108.6	114.4	112.8	118.0
1982	114.1	101.4	121.7	131.2	129.6	124.1
1983	111.1	91.9	123.3	125.0	123.1	116.3
1984	108.6	81.1	122.0	121.2	119.4	101.8
1985	106.3	79.2	122.7	115.3	113.4	106.9
1986	94.2	45.6	98.5	86.1	83.6	72.8
1987	87.2	32.6	81.5	71.9	69.4	41.2
January	84.0	26.4	79.4	64.9	62.4	35.6
February	84.0	29.9	79.4	64.9	62.4	36.1
March	86.6	29.9	79.4	70.7	68.2	39.7
April	88.0	32.5	82.2	73.6	71.1	39.7
May	88.0	32.5	82.2	73.6	71.1	39.7
June	88.0	32.5	82.2	73.6	71.1	39.7
July	88.0	34.1	82.2	73.6	71.1	39.7
August	88.0	34.1	82.2	73.6	71.1	39.7
September	88.0	34.1	82.2	73.6	71.1	46.1
October	88.0	34.9	82.2	73.6	71.1	46.1
November	88.0	34.9	82.2	73.6	71.1	46.1
December	88.0	34.9	82.2	73.6	71.1	46.1

Source: Bank of Japan

Table 6: Consumer Prices for Petroleum Products

	National Price Index (1980=100)			Tokyo Retail Price		
	Gasoline	Kerosene	Propane	Gasoline (1 liter)	Kerosene (18 liters)	Propane (cu. m.)
1981	102.6	105.8	103.7	Y157	Y1,628	Y5,079
1982	111.8	117.2	103.9	172	1,791	5,104
1983	103.2	110.4	104.6	156	1,718	5,134
1984	97.9	101.6	105.1	150	1,613	5,131
1985	94.7	93.1	105.4	146	1,494	5,104
1986	83.3	76.9	102.2	115	948	4,849
1987	80.8*	57.5*	96.5*	126	918	4,746
January	73.4	54.9	98.7	113	927	4,824
February	78.2	56.6	97.3	120	928	4,783
March	79.3	57.2	96.4	122	920	4,758
April	83.6	58.5	96.1	130	925	4,741
May	83.5	58.6	96.1	130	926	4,741
June	83.0	58.5	96.1	129	925	4,741
July	82.1	58.2	96.1	129	919	4,739
August	81.8	58.1	96.1	128	919	4,724
September	81.5	58.0	96.1	128	919	4,724
October	81.4	57.6	96.0	128	916	4,724
November	81.1	56.6	96.0	127	900	4,724
December	n.a.	n.a.	n.a.	127	890	4,724

*Through November only.

Source: Management and Coordination Agency

Table 7: Japan's Non-Crude Oil Energy Imports

(in thousands of units)

	Coal (mt)	Naphtha (kl)	Heavy Fuel Oil (kl)	LPG (mt)	LNG (mt)
1980	68,570	7,363	7,431	9,725	16,324
1981	77,959	7,241	7,404	10,097	16,833
1982	78,535	8,998	6,893	11,861	17,480
1983	75,124	13,096	7,285	10,860	18,748
1984	87,227	13,414	7,342	11,320	25,738
1985	93,448	14,896	7,493	11,540	27,556
1986	90,392	17,294	6,924	11,942	28,261
1987*	82,234	18,312	7201	11,424	26,910

*Through November only.

Source: Ministry of International Trade and Industry

Table 8: Japan's Consumption of Imported Non-Crude Oil Energy

(in thousands of units)

	Coal (mt)			Heavy Fuel Oil (kl)				LPG (mt)			LNG (mt)	
	Coke	Steel	Power	Agri-culture	Manufac-turing	Ship-ping	Power	Chemi-cals	Power	Motor vehicles	Resi-dential	Power
1980	4,309	64,440	10,208	6,433	43,747	6,154	38,360	4,485	3,327	1,548	3,180	12,554
1981	5,197	64,650	13,972	6,444	35,690	4,730	34,508	4,465	2,707	1,241	3,411	12,857
1982	4,330	62,470	15,299	6,323	30,209	4,365	30,983	4,465	2,707	1,241	3,411	12,857
1983	4,551	57,368	18,063	5,707	27,769	4,112	29,476	4,047	3,082	1,822	4,195	14,039
1984	5,014	65,963	20,306	6,086	26,655	4,909	29,220	5,029	3,381	1,843	5,561	19,606
1985	5,821	66,344	23,988	1,303	24,853	4,709	22,271	5,176	3,321	1,722	5,589	21,396
1986	5,528	62,982	23,588	1,498	24,121	4,663	19,952	5,292	3,417	1,728	6,228	21,458
1987	4,326	54,381	21,600	1,299	20,246	3,930	15,462	4,556	2,964	1,278	5,897	20,046

*The figures for coal and liquefied natural gas are through November. The numbers for heavy fuel oil and liquefied petroleum gas go through October only.

Source: Ministry of International Trade and Industry

Table 9: Output of Electric Utilities in Japan

(in billions of kilowatt-hours)

	Total	Hydro	Thermal	Nuclear
1980	514.05	85.15	346.90	82.01
1981	523.14	83.74	352.18	87.23
1982	522.48	77.34	343.30	101.84
1983	555.49	81.39	360.98	113.12
1984	580.41	70.65	378.32	133.23
1985	603.93	81.19	363.75	158.98
1986	601.51	79.55	354.65	167.31
1986: I-III	455.30	64.18	264.33	126.43
1987: I-III	469.56	62.80	268.84	137.93

Source: Ministry of International Trade and Industry

Table 10: Japan's Electricity Consumption

(in billions of kilowatt-hours)

			Power				
				Manufacturing			Rail-
	Total	Light	Total	Total	Chemicals	Steel	roads
1980	464.25	105.27	353.98	190.77	26.79	61.80	12.71
1981	470.56	110.30	360.27	184.29	26.28	58.49	12.86
1982	471.44	112.79	358.65	177.95	29.22	53.69	13.06
1983	499.78	122.22	377.57	182.62	27.55	55.47	13.33
1984	524.53	127.51	397.02	191.97	28.76	57.04	13.13
1985	541.39	133.30	408.09	193.75	28.23	55.88	13.44
1986	537.74	136.52	401.22	182.05	25.61	50.01	13.62
1986: I-III	407.49	103.83	303.66	136.81	19.21	37.55	10.18
1987: I-III	421.70	108.88	315.82	138.78	19.52	36.87	10.37

Source: Ministry of International Trade and Industry

Table 11: Household Energy Consumption in Japan

	Electricity (mil kwh)	Propane (bil kcal)	Kerosene (1,000 kl)	LPG (1,000 mt)	Other Solids (1,000 mt)	Coal (1,000 mt)
1980	103,199	56,008	16,725	4,984	1,212.3	578.5
1981	108,979	58,178	16,730	5,336	970.0	472.5
1982	110,051	58,200	15,275	5,295	1,173.0	512.8
1983	117,905	60,748	15,928	5,460	1,010.3	509.2
1984	125,588	66,065	17,130	5,696	1,413.2	469.1
1985	129,682	65,706	16,060	5,611	1,479.3	371.9
1986	134,078	70,124	16,992	5,835	1,222.5	304.0
1986: I-III	101,740	53,762	11,424	4,254	885.0	202.3
1987: I-III	107,777	53,288	10,351	4,090	579.1*	140.8

Source: Ministry of International Trade and Industry

Table 12: Energy Consumption by Industry in Japan

(in kiloliters of crude oil equivalent)

	Metal Mining	Coal Mining	Textiles	Pulp, Paper and Cardboard	Chemicals	Petro-chemicals
1983	85,704	663,943	4,023,117	10,480,791	57,216,628	10,671,659
1984	73,995	657,159	4,213,267	10,731,896	66,206,821	10,759,857
1985	73,747	635,692	4,218,646	10,838,465	66,477,596	10,374,103
1986	59,912	624,056	4,342,327	11,093,853	67,046,664	10,065,488
1987	41,522	563,563	4,525,413	11,665,369	69,846,332	10,008,241

	Rubber Products	Nonmetallic Mineral Products	Steel	Nonferrous Ores and Metals	Machinery	Total
1983	421,307	15,482,503	45,462,302	4,375,242	13,676,921	133,909,803
1984	428,331	14,493,878	50,509,329	4,427,235	15,249,193	142,880,126
1985	415,468	13,527,752	50,763,316	4,250,973	15,393,058	141,789,300
1986	415,456	12,502,738	46,778,357	3,905,063	14,321,084	139,389,730
1987	400,364	12,280,545	47,333,105	3,757,101	14,926,466	143,452,025

Source: Ministry of International Trade and Industry

Table 13: Long-Term Energy Outlook, November 16, 1983

(in millions of units and percent share)

	FY 1985		FY 1990		FY 1995		FY 2000	
	Units	Share	Units	Share	Units	Share	Units	Share
Coal (mt)	110.9	19.1%	108.0	17.5%	128.0	18.0%	170.0	20.0%
Nuclear (kw)	24.7	9.5	34.0	10.8	48.0	14.0	62.0	16.0
Natural Gas (kl)	41.3	9.4	56.0	12.1	61.0	12.0	66.0	11.0
Hydroelectric (kw)	34.5	4.9	40.0	5.0	43.5	5.0	48.5	5.0
Geothermal* (kl)	0.5	0.1	1.5	0.3	3.5	1.0	7.0	1.0
Alternatives* (kl)	1.3	0.3	8.0	1.7	19.0	4.0	55.0	9.0
Oil (kl)	249.0	56.7	240.0	52.5	450.0	48.0	260.0	42.0
Total* (kl)	439.0	100.0	460.0	100.0	530.0	100.0	600.0	100.0

*Crude oil equivalent

Source: Ministry of International Trade and Industry

Table 14: Long-Term Energy Outlook, October 14, 1987

(in millions of units and percent share)

	FY 1986		FY 1995		FY 2000		FY 2005	
	Units	Share	Units	Share	Units	Share	Units	Share
Coal (mt)	103.9	18.3%	121.0	18.3%	136.0	18.7%	150.0	19.0%
Nuclear (kw)	25.8	9.5	41.5	13.4	53.5	15.9	65.0	18.0
Natural Gas (kl)	42.8	9.9	55.0	11.1	58.0	10.8	60.0	10.0
LNG (kl)	28.8	6.7	36.0	7.3	38.0	7.1	--	--
Hydroelectric (kw)	35.8	4.2	42.5	4.5	45.5	4.4	48.5	4.0
Geothermal* (kl)	0.4	0.1	2.0	0.4	4.4	0.8	6.0	1.0
Alternatives* (kl)	5.5	1.3	12.5	2.5	24.5	4.5	52.0	9.0
Oil (kl)	246.0	56.8	245.0	49.7	242.0	45.0	240.0	42.0
Domestic (kl)	0.7	0.2	1.3	0.3	1.9	0.4	--	--
LPG (mt)	16.2	--	18.0	--	19.0	--	--	--
Total* (kl)	433.0	100.0	490.0	10.00	540.0	100.0	580.0	100.0

*Crude oil equivalent

Source: Ministry of International Trade and Industry